Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed

1.1. Name of the Data, data collection Project, or data-producing Program:

2019 NOAA Topobathy Lidar DEM (Voids): Morro Bay, CA

1.2. Summary description of the data:

These data represent integrated lidar and sonar gridded surface data. Quantum Spatial, Inc. (QSI) collected the topobathymetric lidar using a Riegl VQ880GII system on May 22, 2019. Merkel and Associates collected sonar data to provide bathymetric surface modeling in areas lacking lidar coverage. The sonar was collected between June 17th-19th, 2019 using a SEA SWATHplus-H sonar system. QSI performed the lidar/sonar integration. The dataset includes topobathy data in a LAS 1.4 format file with the following classification:1-Unclassified, 1-O (Overlap bit) - Edge clip (geometrically unreliable points at the edge of flightline swaths), 2-Ground, 7-Noise, 9-NIR water surface, 20-Ignored ground and sonar (excluded for seamless model creation), 40-Bathymetric point, 41-Green laser water surface,and 45- Green laser water column in accordance with project specifications. Sonar data has been assigned a Point Source ID of 9 and a User Byte of 2. All other data is lidar-derived. The NOAA Morro Bay area of covers approximately 4,215 acres over Morro Bay, including the Morro Bay Estuary and roughly 3.6 miles of coastline. LAS files were compiled by 500 m x 500 m tiles.

An automated grounding classification algorithm was used to determine bare earth and submerged topography point classification. The automated grounding was followed with manual editing. Classes 2 (ground), and 40 (submerged topography) were used to create the final DEMs. The full workflow used for this project is documented in the NOAA Morro Bay final report.

Void DEM dataset- A void shapefile was created to indicate areas where there was a lack of bathymetric returns. This shape was created by triangulating bathymetric bottom points with an edge length maximum of 4.56m to identify all areas greater then 9 square meters without bathymetric returns. This shapefile was used to exclude interpolated elevation data from this dataset.

1.3. Is this a one-time data collection, or an ongoing series of measurements?

One-time data collection

1.4. Actual or planned temporal coverage of the data:
2019-05-22 to 2019-06-19

1.5. Actual or planned geographic coverage of the data:
W: -120.875211, E: -120.821145, N: 35.373531, S: 35.304796

1.6. Type(s) of data:
(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)
Model (digital)

1.7. Data collection method(s):
(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)

1.8. If data are from a NOAA Observing System of Record, indicate name of system:

1.8.1. If data are from another observing system, please specify:

2. Point of Contact for this Data Management Plan (author or maintainer)

2.1. Name:
NOAA Office for Coastal Management (NOAA/OCM)

2.2. Title:
Metadata Contact

2.3. Affiliation or facility:
NOAA Office for Coastal Management (NOAA/OCM)

2.4. E-mail address:
coastal.info@noaa.gov

2.5. Phone number:
(843) 740-1202

3. Responsible Party for Data Management
Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:

3.2. Title:
Data Steward

4. Resources

Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

Yes

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

Unknown

5. Data Lineage and Quality

NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible

(describe or provide URL of description):

Lineage Statement:

Topobathy lidar and side scan sonar data were collected within the study area. These data were processed to produce a seamless data set.

Process Steps:

- Data for the NOAA Morro Bay project was acquired by Quantum Spatial (QSI) using a Riegl VQ-880GII Topobathy LiDAR system. Sonar data was collected by Merkel and Associates using a SEA SWATHplus-H sonar system. QSI reviewed all acquired flight lines to ensure complete coverage and positional accuracy of the laser points. QSI creates an initial product call Quick Look Coverage Maps. These Quick Looks files are not fully processed data or final products. The collected LiDAR data is immediately processed in the field by QSI to a level that will allow QA\QC measures to determine if the sensor is functioning properly and assess the coverage of submerged topography. An initial SBET was created in POSPAC MMS 8.1 and used in RiProcess which applies pre-calibrated angular misalignment corrections of scanner position to extract the raw point cloud into geo-referenced LAS files. These files were inspected for sensor malfunctions and then passed through automated classification routines (TerraScan) to develop a rough topobathymetric ground model for an initial assessment of bathymetric coverage. To correct the continuous onboard measurements of the aircraft position recorded throughout the missions, QSI concurrently conducted multiple static Global Navigation Satellite System (GNSS) ground surveys (1 Hz recording frequency) over established monuments located in or around the project area. After the airborne survey, the static GPS data were triangulated with nearby Continuously Operating Reference Stations (CORS) using the Online Positioning User Service (OPUS) for precise positioning. Multiple independent sessions over the same monument were processed to confirm antenna height measurements and to refine position accuracy. QSI then resolved kinematic corrections for aircraft position data using kinematic aircraft GPS and static ground GPS data. A final smoothed best estimate trajectory (SBET) was developed that blends post-processed aircraft position with attitude data.

Sensor head position and attitude are calculated throughout the survey. The SBET data are used extensively for laser point processing. The software Trimble Business Center v.3.90, Blue Marble Geographic Calculator 2017, and PosPac MMS 8.1 SP3 are used for these processes. (Citation: Raw Lidar)

- Next, QSI used RiProcess 1.8.5 to calculate laser point positioning of the Riegl VQ-880GII data by associating SBET positions to each laser point return time, scan angle, intensity, etc. A raw laser point cloud is created in Riegl data format and erroneous points are filtered. Data was exported to LAS 1.4 format and are combined into 500 m x 500 m tiles. Data was then further calibrated using TerraScan, TerraModeler, and TerraMatch and a refraction correction was applied to all sub-water surface returns using QSI proprietary LAS Monkey software. QSI used custom algorithms in TerraScan to create the initial ground/submerged topography surface. Relative accuracy of the green swaths was compared to overlapping and adjacent swaths and verified through the use Delta-Z (DZ) orthos created using QSI's DZ Ortho creator. Absolute vertical accuracy of the calibrated data was assessed using ground RTK survey data and complete coverage was again verified. QSI then performed manual editing to review all classification and improve the final topobathymetric surface. A final bathymetric void shape was created after final editing and provided to Merkel and Associates to target for sonar data collection. The acquired sonar was then integrated into the LiDAR dataset to provide a seamless bathymetric model. As a general rule, in areas of overlap sonar data was prioritized in deeper areas of the channel while LiDAR data was prioritized in shallower areas of the channel including all areas not submerged during the LiDAR collection. As the lidar laser approaches the laser's extinction point bathymetric surface profiles and point density degrade thus the prioritization of sonar data in these areas. Conversely side-scan sonar does better when water depths are greater than 1m as areas shallower than this are prone to increased noise making the lidar data more reliable in these areas. Within the Morro Bay site there was one notable area of significant temporal change. The sand spit at the mouth of the bay displayed a difference as great as 5 meters from the lidar survey. Despite this area being collected at true ground during the lidar survey, the sonar data was used in this area being the most temporally recent data and collected at high tide with high confidence in the surface. All data from either sensor that was not used in model creation is still preserved in the point cloud as Ignored Ground/Bathymetry (class 20). Please see Appendix B of the NOAA Morro Bay Report for more information regarding the sonar acquisition and processing. Final topobathymetric DEMs were created at 1m pixel resolution using ground (class 2) and bathymetry (class 40) . (Citation: Processed Lidar)
- Void DEM dataset- A void shapefile was created to indicate areas where there was a lack of bathymetric returns. This shape was created by triangulating bathymetric bottom points with an edge length maximum of 4.56m to identify all areas greater then 9 square meters without bathymetric returns. This shapefile was used to exclude interpolated elevation data from this dataset. (Citation: Processed Lidar)

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):

6. Data Documentation

The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?

No

6.1.1. If metadata are non-existent or non-compliant, please explain:

Missing/invalid information:
- 1.7. Data collection method(s)
- 3.1. Responsible Party for Data Management
- 5.2. Quality control procedures employed
- 7.1.1. If data are not available or has limitations, has a Waiver been filed?
- 7.4. Approximate delay between data collection and dissemination
- 8.3. Approximate delay between data collection and submission to an archive facility

6.2. Name of organization or facility providing metadata hosting:

NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:

https://www.fisheries.noaa.gov/inport/item/57923

6.4. Process for producing and maintaining metadata

(describe or provide URL of description):

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access

NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides

information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

Yes

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:

NOAA Office for Coastal Management (NOAA/OCM)

7.2.1. If data hosting service is needed, please indicate:

7.2.2. URL of data access service, if known:

https://coast.noaa.gov/dataviewer/#/lidar/search/where:ID=8893
https://coast.noaa.gov/htdata/raster2/elevation/NOAA_MorroBay_Voids_8893/

7.3. Data access methods or services offered:

Data is available online for custom downloads

7.4. Approximate delay between data collection and dissemination:

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:

8. Data Preservation and Protection

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:

(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

NCEI_CO

8.1.1. If World Data Center or Other, specify:

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:

8.2. Data storage facility prior to being sent to an archive facility (if any):

Office for Coastal Management - Charleston, SC

8.3. Approximate delay between data collection and submission to an archive facility:

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

Data is backed up to tape and to cloud storage.

9. Additional Line Office or Staff Office Questions

Line and Staff Offices may extend this template by inserting additional questions in this section.